Factorial analysis of Ferulic Acid production from biowaste

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ABSTRACT

There were countless attempts on applying biowaste from agriculture activities as a feedstock for renewable energy and other various biomaterials, since it abundantly possessed complex carbohydrate and aromatic polymer structure called lignocellulose which has been available around the world. Ferulic acid (FA) recognized to be great anti-oxidant compounds are a sought-after product and desired by healthcare, pharmaceutical and food industries around the globe. This study employed enzymatic hydrolysis of feruloyl-polysaccharide from banana stem waste (BSW) by a novel mixed culture from soil to produce FA using 25 full factorial design (FFD). The effect and interaction of five factors affecting FA production were investigated, namely; fermentation temperature (A; oC), agitation (B; rpm), water-to-BSW ratio (C;v/v), substrate-to-inoculums ratio (D;v/v), and time (E; days). The linear model was well fitted at R2=0.8019 with factors contribution percentages in the order of E > C > A > D > B. Time had 27.37% contribution indicating the importance of cell growth activities during incubation that highly affected product yield. Meanwhile, interaction of DE was highly significant showing the trend of substrate utilization throughout the microbe feeding time closely related to the process's mechanism behavior. The most FA output produced was 1.2187 mg FA/g BSW with parameters at ambient (26 0C) temperature, 150 rpm agitation, 1:1 water-to-BSW ratio, 1:1 substrate-to-inoculums ratio, and one day. The hydrolysis process applied in this study was found to be affected by various factors, yet could be a great option for the production of FA as the highly valuable bio material. Furthermore, BSW was proven significantly feasible and great for producing FA naturally.

KEYWORDS: Ferulic acid; Agricultural Waste; Experimental Design; Soil mixed culture; Environmental Biotechnology

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